

Relationship between inflammatory parameters and total IgE values in patients diagnosed with asthma

The relationship between total IgE and asthma

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Abstract

Aim: In this study, we aimed to investigate the relationship between Total IgE levels obtained during follow-up of asthma patients receiving moderate to high dose inhaled corticosteroid therapy with a pre-diagnosis of lower respiratory tract infection, and post-treatment, with infective parameters, hospitalization, and frequency of attacks.

Material and Methods: Retrospective analysis was conducted on 132 patients diagnosed with asthma, despite the use of moderate to high dose inhaled steroids, based on their medical history, pulmonary function tests, and laboratory investigations.

Results: The frequency of Total IgE levels being 100 or higher in patients hospitalized in the last year and the frequency of decrease in Total IgE levels with a decrease in CRP levels were statistically significantly higher among the patients included in the study. In conclusion, the frequency of attacks and hospitalizations was statistically significant in patients with variable Total IgE levels.

Discussion: We observed statistically significant increase in Total IgE levels in patients followed with a preliminary diagnosis of lower respiratory tract infection. Additionally, a significant correlation was observed between elevated Total IgE levels and patients who experienced exacerbations within a year and those hospitalized due to asthma attacks. This suggests that Total IgE may be valuable both in predicting the severity of the disease and in assessing the risk of exacerbation within a year in asthma patients. Furthermore, the data in our study suggest that serum Total IgE levels may be valuable as a biomarker in patients with Asthma-COPD overlap.

Keywords

Asthma, Total Ige, Ashtma Attack

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This study was approved by the Ethics Committee of Bolu Abant İzzet Baysal University (Date: 2023-07-10, No: 2023/216)

Introduction

Asthma is a heterogeneous disease characterized by chronic airway inflammation and variable airflow limitation. The clinical features, natural course, pathophysiological mechanisms, and treatment response of the disease vary among different asthma types. The best-known endotype of asthma is Type 2 asthma, characterized by the presence of Th2 cytokines accompanying airway and peripheral blood eosinophilia. IgE is a major immunoglobulin involved in allergic response and parasitic infections. Total and antigen-specific IgE measurements assist in the diagnosis of allergic diseases. Although IgE levels are not specific for the diagnosis of asthma, they are a critical factor in the development of bronchial hyperreactivity in asthmatics. In our study, we investigated the relationship between Total IgE and infectious parameters during follow-up of asthma patients receiving medium to high-dose ICS therapy with a pre-diagnosis of lower respiratory tract infection, as well as the relationship between Total IgE levels and asthma attacks and hospitalizations experienced in the last year [1 - 3].

Material and Methods

The inclusion criteria for the study were as follows: patients diagnosed with asthma who presented to the Chest Diseases Clinic of Bolu Abant Izzet Baysal University Training and Research Hospital, had symptoms despite using medium to high doses of inhaled steroids, had laboratory tests (complete blood count, CRP, Total IgE, control Total IgE) performed, and had chest X-rays requested at the time of evaluation. Exclusion criteria included those diagnosed with any rheumatological disease, those who received steroid treatment for any indication other than asthma, those diagnosed with any allergic disease other than asthma, those using anti-IgE therapy, and those diagnosed with immunodeficiency.

This study is a retrospective cohort study. The study population consisted of patients who presented to the Chest Diseases Clinic of Bolu Abant Izzet Baysal University Training and Research Hospital between 01.01.2017 and 01.01.2021 and met the criteria.

Ethical Approval

This study was approved by the Ethics Committee of Bolu Abant Izzet Baysal University (Date: 2023-07-10, No: 2023/216).

Results

The mean age of the patients included in the study was determined to be 63.53±12.95 years. 62.12% of the participants (n=82) were male. It was observed that 51.52% of the patients (n=68) had a Total IgE value of 100 or higher, 75.76% (n=100) had a CRP value of 5 mg/dL or higher, and 12.12% (n=16) had an eosinophil count of 0.4 x 10³/μL or higher. In the study, radiological findings were present in 61.07% of the patients (n=80) on Posterior-Anterior chest X-rays. 82.58% (n=109) had obstructive respiratory function tests, 10.61% (n=14) had normal results, and 4.55% (n=6) had a restrictive pattern. It was determined that 52.27% of the patients (n=68) were hospitalized, and 48.48% (n=64) had asthma attacks. In 30.30% of the patients (n=40), there was a decrease in Total IgE with a decrease in CRP levels. The percentage of patients evaluated as Asthma-COPD Overlap (ACO) was 11.36% (n=15).

In the study, the frequency of patients with Total IgE levels of 100 and above was statistically significantly higher among those with CRP levels of 5 mg/dL and above (p<0.01).

In the study, the frequency of patients hospitalized for asthma attacks during one year, with Total IgE levels of 100 and above, the frequency of asthma attacks, and the frequency of a decrease in Total IgE with a decrease in CRP levels were statistically significantly higher (p<0.01).

The frequency of patients hospitalized with obstructive spirometry findings was higher than those not hospitalized, while the frequency of having normal spirometry findings was lower. There was a statistically significant difference between the groups (p<0.01) (Table 1).

In the study, the frequency of patients experiencing attacks within the last year, with Total IgE levels of 100 and above, and the frequency of a decrease in Total IgE with a decrease in CRP levels were statistically significantly higher (p<0.01).

The frequency of patients experiencing attacks having an obstructive pattern in spirometry was higher than those without attacks, while the frequency of having a normal pattern was lower. There was a statistically significant difference between the groups (p<0.01) (Table 2).

In the study, the frequency of total IgE levels being 100 and above in patients evaluated as Asthma-COPD Overlap was statistically significantly higher than in patients not evaluated as Asthma-COPD Overlap.

The frequency of radiological findings in the Posterior-Anterior chest X-rays of patients with CRP levels of 5 mg/dL and above was statistically significantly higher compared to those with CRP levels below 5 mg/dL (p<0.01).

In the study, patients with a decrease in CRP accompanied by a decrease in total IgE were found to have a statistically significantly higher frequency of hospitalization and asthma attacks (p<0.01) (Table 3).

Discussion

In our study, the symptoms, physical examination findings, and radiological evaluations of patients diagnosed with asthma and receiving medium to high dose inhaled corticosteroid treatment were considered as a preliminary diagnosis of lower respiratory tract infection. According to the Turkish Thoracic Society Asthma guideline, asthma is reported to be more common in females compared to males in our country [4]. However, in our study, the proportion of male participants was higher than females (62% male participants). Additionally, the average age of asthma onset is reported to be 50 years, but the average age of our patients was 63. We believe that the distribution of gender and age in our study is related to our inclusion and exclusion criteria.

In our study, it was observed that some patients had elevated total IgE levels. In studies conducted in the literature, it is also reported that serum total IgE levels are elevated in adults with allergic asthma [5]. Furthermore, it has been stated that elevated Total IgE levels are associated with asthmatic patients [6].

In spirometric evaluations of the patients, it was observed that most of them had an obstructive pattern. However, normal and restrictive patterns were also observed in some patients.

Table 1. Comparison of Patients’ Laboratory and Disease Characteristics with Hospitalizations in the Last Year

		Hospitalization				p
		-		+		
		N	%	N	%	
Total IgE	<100	44	69,84	20	28,99	ª<0,001*
	≥100	19	30,16	49	71,01	
CRP (mg/dl)	<5	16	25,4	16	23,19	ª0,767
	≥5	47	74,6	53	76,81	
Eosinophil(103/µl)	<0,4	58	92,06	58	84,06	ª0,159
	≥0,4	5	7,94	11	15,94	
Radiological Findings	-	27	42,86	24	35,29	ª0,375
	+	36	57,14	44	64,71	
SFT	Normal	12	19,67	2	2,94	ª0,003*
	Obstructive	45	73,77	64	94,12	
	Restrictive	4	6,56	2	2,94	
Asthma attack	-	62	98,41	6	8,7	ª<0,001*
	+	1	1,59	63	91,3	
Decrease in CRP with Total IgE Level	Not Decreasing	53	84,13	39	56,52	ª0,001*
	Decreasing	10	15,87	30	43,48	
ACO	-	56	88,89	61	88,41	ª0,930
	+	7	11,11	8	11,59	
ªKi kare test		*p<0,01				
ªFisher-Freeman-Halton test						

Table 2. Comparison of Patients’ Laboratory and Disease Characteristics with Asthma Attack

		Asthma Attack				p
		-		+		
		N	%	N	%	
Total IgE	<100	46	67,65	18	28,13	ª<0,001**
	≥100	22	32,35	46	71,88	
CRP (mg/dl)	<5	19	27,94	13	20,31	ª0,307
	≥5	49	72,06	51	79,69	
Eosinophil (103/µl)	<0,4	61	89,71	55	85,94	ª0,507
	≥0,4	7	10,29	9	14,06	
Radiological Findings	-	28	41,18	23	36,51	ª0,584
	+	40	58,82	40	63,49	
Pulmonary Function Findings	Normal	12	18,18	2	3,17	ª0,010*
	Obstructive	50	75,76	59	93,65	
	Restrictive	4	6,06	2	3,17	
Decrease in CRP with Total IgE Level	Not Decrasing	58	85,29	34	53,13	ª<0,001**
	Decrasing	10	14,71	30	46,88	
ACO	-	61	89,71	56	87,5	ª0,690
	+	7	10,29	8	12,5	
ªKi kare test		*p<0,05		*p<0,01		
ªFisher-Freeman-Halton test						

Table 3. Comparison of Patients’ Hospitalization and Attack Characteristics with Decrease in CRP and Total IgE Reduction

		Decrease in CRP with Total IgE Level				p
		Not Decrasing		Decrasing		
		N	%	N	%	
Hospitalization	-	53	57,61	10	25	ª0,001*
	+	39	42,39	30	75	
Asthma Attack	-	58	63,04	10	25	ª<0,001
	+	34	36,96	30	75	
ªKi kare test	*p<0,01					

This suggests that spirometry values in asthma patients can vary between obstructive and normal due to reversible airway obstruction observed in asthma. Additionally, restrictive spirometry findings may rarely be observed in advanced stages of the disease. A low FEV1 value under treatment (especially <60%) suggests that the patient is at risk for asthma attacks and persistent airflow limitation.

Among the infective parameters, it was observed that patients with CRP levels of 5 mg/dL and above had elevated total IgE levels. Additionally, it was observed that patients who had attacks had high total IgE levels and a decrease in total IgE with a decrease in CRP. These results indicate that total IgE levels may increase in relation to infections in asthma-diagnosed patients.

In a study, it has been stated that atypical bacterial pneumonia pathogens play an important role in the pathogenesis of asthma, and it has been concluded that *C. pneumoniae* infection can trigger IgE-specific responses in asthmatics [7]. In our study, we also observed a statistically significant elevation of Total IgE in patients followed up with a pre-diagnosis of lower respiratory tract infection. With this result, we conclude that lower respiratory tract infections may lead to Total IgE elevation in patients diagnosed with asthma. However, due to not including microbiological culture evaluation in our study, we cannot reach a conclusion associated with the pathogen.

Patients who experienced asthma attacks or were hospitalized in the last year, included in the study, showed a statistically significant frequency of Total IgE levels being 100 or higher, and a frequency of decrease in Total IgE levels with a decrease in CRP levels. Similar evaluations have been analyzed in previous studies, and similar results have been obtained with our study. In one study, increased total IgE levels were found to have a negative correlation with lung function in patients with a history of asthma. [8] Another study conducted in Spain reported that there was no significant relationship between disease severity or degree of airflow limitation, but a higher percentage of patients in the severe asthma subgroup had IgE levels >400 IU/mL [5]. In another study, the authors concluded that the asthma control test score was significantly lower in patients with IgE increase or decrease compared to patients with unchanged IgE levels. However, they found that these patients experienced more acute exacerbations within one year [9]. These results indicate that variable IgE levels over time are associated with poor asthma control. In our study, a significant correlation was observed between increased Total IgE levels and patients experiencing attacks within one year. This suggests that Total IgE may be valuable both in predicting disease severity and assessing the risk of asthma attacks within one year. A similar situation was observed for patients hospitalized in the last year, and variable Total IgE levels in controls may be valuable in predicting hospitalization within one year [10].

Limitations of the study include:

Inability to perform culture studies

Inability to perform procalcitonin studies

Low number of ACO patients

Conclusion

Despite these limitations, the results of our study indicate

that total IgE levels may be an important biomarker in asthma patients and may vary in relation to infections.

Scientific Responsibility Statement

The authors declare that they are responsible for the article's scientific content including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.

Animal and Human Rights Statement

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

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Conflict of Interest

The authors declare that there is no conflict of interest.

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